

31. (Amended) The system for determining a title from a document image according to claim 23 wherein said natural language analysis unit generates an analysis result on at least one criterion of said multiple criteria indicating whether or not said characters end in a noun form.

32. (Amended) The system for determining a title from a document image according to claim 23 wherein said natural language analysis unit generates an analysis result on at least one criterion of said multiple criteria indicating whether or not said characters end in a set of predetermined suffixes.

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33. (Amended) The system for determining a title from a document image according to claim 20 wherein said character row area determination unit generates at least one criterion of said multiple criteria based on a ratio between a length and a height of each of said circumscribing rectangles.

34. (Amended) The system for determining a title from a document image according to claim 20 wherein said character row area determination unit generates at least one criterion of said multiple criteria based on a ratio between a summed width of said characters and a corresponding one of said circumscribing rectangles.

A copy of the claims, with amendments marked, appears in Appendix 3.

REMARKS

The Rejections under 35 USC §102

The Examiner rejected claims 1 and 19 under 35 USC §102 as allegedly being anticipated by Abe. Although Applicant does not necessarily agree with all of the Examiner's allegations, independent claims 1 and 19 have been amended to clarify the patentable features of the current invention.

Newly amended independent claims 1 and 19 now each explicitly recite "a single value based upon multiple criteria obtained during said character recognition and said title evaluation" In other words, the newly amended independent claims recite that the decision of whether or not a given minimum circumscribing rectangle contains the title of a document depends on

one quantity or a single value. This single value represents one quantity that is assigned based on a combination of two or more individual criteria.

The above claim amendments are supported by the original disclosures of the current application. See, for example, Figure 4, specification page 10 at lines 10-22, and the claims as originally filed. For this reason, Applicant respectfully submits that the claim amendments do not add any new matter to the current application.

In contrast to the above explicit recitation of the patentable features, the Abe reference describes determining a title based upon individual criteria, such as font size, or the position of a font of a particular size on a given page. Despite these disclosures, the cited reference fails to anticipate the condition of “a single value based upon multiple criteria” as explicitly recited in newly amended independent claims 1 and 19. Although the Abe reference sets forth a method of identifying a title based upon individual pieces of information, the cited reference lacks any disclosure to anticipate combining the individual criteria to produce a single quantity to express the likelihood that a given string of text includes a title.

Based upon the above clear patentable distinction, Applicant respectfully submits to the Examiner that the Abe reference fails to anticipate every element of newly amended independent claims 1 and 19. Therefore, Applicant further respectfully submits to the Examiner that the pending section 102 rejections should be withdrawn upon reconsideration.

The Rejections under 35 USC §103

The Examiner has rejected claims 2-18 and 20-36 as allegedly obvious. Claims 2-12, 15-18, 20-30, and 33-36 are rejected over Abe in light of Katsuyama, and claims 13, 14, 31, and 32 are rejected over Abe in view of Katsuyama, further in view of Chen.

As discussed above, the Abe reference sets forth a method of identifying a title based upon individual pieces of information such as font size, or the position of a font of a particular size on a given page. The cited reference, however, lacks any disclosure or suggestion for combining the individual criteria to produce a single quantity to express the likelihood that a given string of text includes a title.

The Katsuyama reference describes a method of title extraction using multiple criteria to which points are assigned; however, this reference contains no teaching or suggestion regarding natural language.

Finally, Chen describes certain techniques for identifying user-defined keywords without resolving the individual characters. In Chen, prefixes and suffixes of the user-defined keywords are identified by whether they contain characters that extend to the top of a line of text or descend below a line of text. In other words, the Chen reference relies on the character image and fails to rely upon natural language information. Furthermore, the Chen reference fails to teach or suggest how the techniques might be applied to title extraction.

Applicant respectfully submits that newly amended independent claims 1 and 19 are not obvious in light of the cited references. With respect to the rejection over Abe in view of Katsuyama, newly amended claims 1 and 19 respectively recite a method and a system of “determining a title from a document image.” Both the newly amended method and the system claims require that the title be determined by “a single value based upon multiple criteria”, wherein natural language likelihood is always required as one of the criteria. Natural language factors exemplified in the specification include identifying specific words, such as “title:” or “re:”, or determining whether a word is in noun form, or whether it ends in a certain suffix. Neither Abe nor Katsuyama contains any teaching or suggestion regarding natural language likelihood. The cited references, therefore, fail to teach, disclose, or suggest every element of Applicant’s claimed invention.

With respect to the rejection over Abe in view of Katsuyama and Chen, Applicant respectfully submits that these references neither teach nor suggest the combination of elements in the claims as amended herein. First, neither Abe nor Katsuyama includes any teaching about natural language, and Chen includes no teaching about title extraction. Moreover, Chen teaches away from the present invention, because the purpose of Chen’s invention is to recognize keywords without recognizing the individual characters or words. By contrast, Applicant’s independent claims 1 and 19 respectively require a character recognition step and a character

recognition unit. In attempt to provide Applicant's invention, the Chen fails to provide any suggestion for combining Abe and Katsuyama.

Applicant therefore respectfully submits that the cited references do not contain any suggestion or motivation to combine the elements as claimed in the present application. Because of the lack of the necessary suggestion, Applicant further respectfully submits that the Chen reference may not properly be cited in an rejection of Applicant's claims under 35 USC § 103.

Based upon the above discussed patentable features of the newly amended independent claims, Applicant respectfully submits that it would not have been obvious to one of ordinary skill to provide the patentable features of newly amended independent claims 1 and 19 based upon the cited references alone or in combination.

All of the dependent claims currently pending in the present application ultimately depend from newly amended independent claim 1 or 19, and therefore incorporate the above discussed patentable features of the newly amended independent claims. Because newly amended independent claims 1 and 19 are not obvious over the cited references, dependent claims 3-18 and 21-36 are also not obvious. Therefore, the Applicant respectfully submits that the pending section 103 rejections should be withdrawn upon reconsideration.

Other Amendments

The specification has been amended to further clarify two incorporations by reference, and also to correct an apparent typographical error in the detailed description.

Claims 2, 3, 6, 7, 9, 11, 13-16, 20, 21, 25, 27, and 31-34 have been amended to compensate for the changes in antecedent nouns that result from the present amendments to claims 1 and 19.

In addition, claims 33 and 34 are amended to rectify an apparent typographical error. Because claims 33 and 34 are both directed to systems, rather than methods, they depend from claim 20, rather than claim 2.

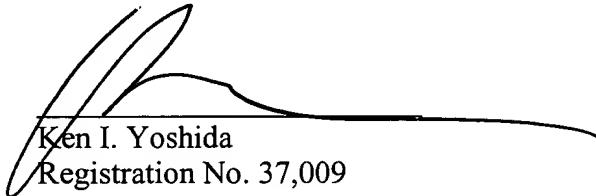
Claims 4, 12 and 30 have been amended to further clarify their scope.

The above amendments are purely formal. Accordingly, Applicant believes that these amendments do not introduce new matter into the application. Furthermore, Applicant believes that the above amendments do not change the scope of the claims

Conclusion

In view of the above amendments and the foregoing remarks, Applicant respectfully submits that all of the pending claims are in condition for allowance and respectfully requests a favorable Office Action so indicating.

Respectfully submitted,



Ken I. Yoshida
Registration No. 37,009

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KNOBLE & YOSHIDA LLC
Eight Penn Center, Suite 1350
1628 John F. Kennedy Blvd.
Philadelphia, PA 19103
(215) 599-0600

Appendices: 1. Replacement Paragraphs of the Specification
2. Replacement Paragraphs of the Specification, with Amendments Marked
3. Claims with Amendments Marked

Appendix 2: Replacement Paragraphs of the Specification, with Amendments Marked**Paragraph beginning on page 4 at line 6:**

Now referring to FIGURE 4, a block diagram illustrates a third preferred embodiment of the system for determining a title from a document image according to the current invention. An image input unit 121 inputs a document image, and a document image storage unit 122 stores the inputted document image. A character row area determination unit 123 determines areas or minimal circumscribing rectangles that contain characters. The character row area determination unit 123 outputs the coordinates as well as the size of character row areas to a character recognition unit 124 as well as a title evaluation point determination unit 128. The character recognition unit 124 recognizes characters from character image portions in the character row areas. For A reference describing the character recognition, disclosures in U.S. Pat. No. 5,966,464 ~~are hereby, is incorporated by external referenced reference herein in its entirety.~~ The character recognition unit 124 generates corresponding character codes as well as other associated information. Other associated information includes the character recognition assurance level, the coordinates of a minimal circumscribing rectangle and the size of the rectangle. The outputs from the character recognition unit 124 are sent to a font determination unit 125, the title evaluation point determination unit 128, a natural language analysis unit 126 and a recognition result storage unit 129. The font determination unit 125 determines a font type and other associated information for each character and outputs the font information to the title evaluation point determination unit 128. A reference describing Disclosures on the font determination, in Japanese Patent Laid Publication Hei 9-319830, is are hereby incorporated by reference herein in its entiretyexternal referenced. The natural language analysis unit 126 compares the recognized characters against a predetermined dictionary and determines whether or not the recognized characters match or resemble any of the predetermined titles or words in a dictionary. For example, the dictionary contains a set of predetermined suffixes which indicate a noun form and its corresponding statistical information. The natural language analysis unit 126 also outputs the determination information to the title evaluation point determination unit 128. A characteristics extraction unit 127 extracts information on certain layouts such as underlining, centering and the minimal circumscribing rectangle size from the input image and outputs the information to the title evaluation point determination unit 128. For example, if the character size is beyond 18-point in an A4 image, the minimal circumscribing rectangle containing the

characters is assigned a high score. Similarly, a high score is assigned to a minimal circumscribing rectangle if a number of characters or words in the rectangle is less than a predetermined number. For example, for the Japanese language, the predetermined number of characters may be set to twelve. The above and other predetermined numbers are user-definable.

Paragraph beginning on page 9 at line 29:

FIGURE 7 illustrates other acts involved in determining the likelihood based upon a number of characters according to the current invention. In act A401, a document image is inputted, and character row areas are determined in act A402. After the character image in the character row areas is converted into character codes, a number of characters is determined. The number of characters is compared to a predetermined threshold value in act A404. A set of predetermined threshold values is optionally stored in a statistical dictionary for different types of documents. If the number of characters is below the predetermined threshold value in act A405, a predetermined number of points is added to the likelihood for the character row area and a title area selection is determined based upon the total number of points in act A406. On the other hand, if the number of characters is below above the predetermined threshold value in act A405, other predetermined processing is performed.

Appendix 3: Claims with Amendments Marked

1. (Amended) A method of determining a title from a document image, comprising:
 - dividing the document image into minimal circumscribing rectangles which contain a character image;
 - recognizing characters in said minimal circumscribing rectangles; and
 - determining a title of the document image based upon a likelihood of each of said minimal circumscribing rectangles containing a title, said likelihood being determined by a single value based upon information multiple criteria obtained during said character recognition and said title determination, said multiple criteria comprising natural language likelihood and any combination of character row area coordinates, character type, number of characters, character code assurance, character minimum circumscribing rectangle coordinates, and character minimum circumscribing rectangle size.
2. (Amended) The method of determining a title from a document image according to claim 1 wherein said likelihood is expressed in single value includes a sum of points based on said multiple criteria information.
3. (Amended) The method of determining a title from a document image according to claim 2 wherein said information includes multiple criteria include characteristics on font.
4. (Amended) The method of determining a title from a document image according to claim 2 wherein said font characteristics is determined on include a frequency of a particular font type.
6. (Amended) The method of determining a title from a document image according to claim 5 wherein said multiple criteria include information includes a result of said matching with said predetermined words.
7. (Amended) The method of determining a title from a document image according to claim 2 wherein said multiple criteria include information includes a number of said characters.

9. (Amended) The method of determining a title from a document image according to claim 2 wherein said multiple criteria include information includes an assurance level of said character recognition.

11. (Amended) The method of determining a title from a document image according to claim 2 wherein said multiple criteria include information includes layout characteristics.

12. (Amended) The method of determining a title from a document image according to claim 11 wherein said information includes layout characteristics include centering, underlining, and size, or any combination thereof.

13. (Amended) The method of determining a title from a document image according to claim 2 wherein said information indicates multiple criteria include an indication of whether or not said characters end in a noun form.

14. (Amended) The method of determining a title from a document image according to claim 2 wherein said multiple criteria include an indication of information indicates whether or not said characters end in a set of predetermined suffixes.

15. (Amended) The method of determining a title from a document image according to claim 2 wherein said multiple criteria include information includes a ratio between a length and a height of each of said circumscribing rectangles.

16. (Amended) The method of determining a title from a document image according to claim 2 wherein said multiple criteria include information includes a ratio between a summed width of said characters and a corresponding one of said circumscribing rectangles.

19. (Amended) A system for determining a title from a document image, comprising:
a character row area determination unit for dividing the document image into minimal circumscribing rectangles which contain a character image;
a character recognition unit connected to said character row area determination unit for recognizing characters in said minimal circumscribing rectangles; and

a title evaluation point determination unit connected to said character recognition unit for determining a title of the document image based upon a likelihood of each of said minimal circumscribing rectangles containing a title, said likelihood being determined by a single value based upon information multiple criteria obtained during said character recognition and said title evaluation, said multiple criteria comprising natural language likelihood and any combination of character row area coordinates, character type, number of characters, character code assurance, character minimum circumscribing rectangle coordinates, and character minimum circumscribing rectangle size.

20. (Amended) The system for determining a title from a document image according to claim 19 wherein said title evaluation point determination unit determines said likelihood single value in terms of a sum of points based on said multiple criteria information.

21. (Amended) The system for determining a title from a document image according to claim 20 wherein said title evaluation point determination unit further comprises a font determination unit for generating information at least one criterion of said multiple criteria on font characteristics.

25. (Amended) The system for determining a title from a document image according to claim 20 wherein said character recognition unit generates said information at least one criterion of said multiple criteria based on a number of said characters.

27. (Amended) The system for determining a title from a document image according to claim 20 wherein said character recognition unit generates at least one criterion of said multiple criteria based said information on an assurance level of said character recognition.

30. (Amended) The system for determining a title from a document image according to claim 29 wherein said extraction unit extracts said layout characteristics on centering, underlining and, size, or any combination thereof.

31. (Amended) The system for determining a title from a document image according to claim 23 wherein said natural language analysis unit generates an analysis result on at least one

criterion of said multiple criteria said information indicating whether or not said characters end in a noun form.

32. (Amended) The system for determining a title from a document image according to claim 23 wherein said natural language analysis unit generates an analysis result on at least one criterion of said multiple criteria said information indicating whether or not said characters end in a set of predetermined suffixes.

33. (Amended) The system for determining a title from a document image according to claim 20² wherein said character row area determination unit generates at least one criterion of said multiple criteria based said information on a ratio between a length and a height of each of said circumscribing rectangles.

34. (Amended) The system for determining a title from a document image according to claim 20² wherein said character row area determination unit generates at least one criterion of said multiple criteria based said information on a ratio between a summed width of said characters and a corresponding one of said circumscribing rectangles.